REMARKS

The Final Office Action mailed February 20, 2009 has been received and reviewed. Claims 1, 3 through 22, 24 through 27, 31 through 40, 42 and 43 are currently pending in the application. Claims 1, 3 through 22, 24 through 27, 31 through 40, 42 and 43 stand rejected. Claims 1, 7, 14, 18, 24-26, 31, 35, 38, 42 and 43 have been amended herein. Applicants have amended claims 1, 7, 18, 24, 25 and 26 herein to correct typographical errors. Support for the amendments may be found throughout the as-filed specification, for example, page 15, lines 11-15; FIGs. 8A/8B, 9A/9B. No new matter is added. Reconsideration is respectfully requested.

Interview

On June 17, 2009, a telephone interview occurred between the Examiner and Krista Powell, Applicants' attorney. The parties discussed procedural options to amend claim 14 to address the 35 U.S.C. §112 rejection in view of the pending Notice of Appeal. Applicants' appreciate the courtesy extended by the Examiner during the telephone call.

Specification

The Specification has been amended to remove the objected to language as identified in the Office Action mailed February 20, 2009, page 2. Reconsideration and withdrawal of the objection is requested.

35 U.S.C. §112

Claim 14 has been amended to address the rejection under 35 U.S.C. §112. Specifically, it was stated that no support exists for the claim language "removing the first silicon dioxide layer" as recited in claim 14. Applicants have amended claim 14 to recite "removing the ~~first silicon dioxide layer and~~ silicon nitride layer and portions of the oxide layer underlying the ~~first silicon dioxide~~ silicon nitride layer" which is supported by the as-filed Specification including, for example, page 15, lines 11-17. No new matter is added. Reconsideration and withdrawal of the rejection is requested.

35 U.S.C. §103(a)

1. Claims 1, 3-9, 11, 12, 14-22, 24-26, 31-40, 42 and 43 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Omid-Zohoor (U.S. Patent No. 6,097,072) in view of Poon et al. (U.S. Patent 5,387,540). Applicants respectfully traverse this rejection, as hereinafter set forth.

Omid-Zohoor discloses a method of forming trenches with suppressed parasitic edge transistors. Trenches 360 are formed in a substrate 120 having a pad oxide layer 340 and silicon nitride layer 344 thereon. (Omid-Zohoor, FIG. 3I). Spacers 356 may flank the trenches 360. A thick oxide layer 364 is deposited to cover the wafer and fill the trenches 360. A reverse mask 368 is placed over defined trench regions. The mask is followed by an etch which creates oxide ridges. (Omid-Zohoor, col. 4, lines 47-55, FIG. 3L). The upper surface of the oxide layer 372 is polished to expose the silicon nitride layer 344. (*Id.,* FIG. 3M). The silicon nitride layer 344 is removed, but the pad oxide layer 340 remains. (*Id.* at col. 5, lines 2-4). Portions of the overfilled oxide 376 and pad oxide 344 are removed together resulting in slight oxide humps above the trenches. (*Id.,* FIG. 3N).

Poon is cited for teaching the formation of a liner along the sidewall of a trench. (Office Action mailed February 20, 2009, page 5).

To establish a *prima facie* case of obviousness the prior art reference (or references when combined) **must teach or suggest all the claim limitations**. *In re Royka*, 490 F.2d 981, 985 (CCPA 1974); *see also* MPEP § 2143.03. Additionally, the Examiner must determine whether there is "an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740-1741, 167 L.Ed.2d 705, 75 USLW 4289, 82 U.S.P.Q.2d 1385 (2007). Further, rejections on obviousness grounds "cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *Id* at 1741, quoting *In re Kahn*, 441, F.3d 977, 988 (Fed. Cir. 2006). To establish a *prima facie* case of obviousness

there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Furthermore, the reason that would have prompted the combination and the reasonable expectation of success must be found in the prior art, common knowledge, or the nature of the problem itself, and not based on the Applicant's disclosure. *DyStar Textilfarben GmbH & Co. Deutschland KG v. C. H. Patrick Co.*, 464 F.3d 1356, 1367 (Fed. Cir. 2006); MPEP § 2144. Underlying the obvious determination is the fact that statutorily prohibited hindsight cannot be used. *KSR*, 127 S.Ct. at 1742; *DyStar*, 464 F.3d at 1367.

In view of this standard and the arguments set forth below, Applicants respectfully submits that the Office has not established a *prima facie* case of obviousness under 35 U.S.C. § 103(a).

(a) *Claims 1, 3-9, 11 and 12*

The proposed combination of Omid-Zohoor and Poon fails to teach or suggest "implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer" or "removing the first dielectric layer and portions of the oxide layer underlying the first dielectric layer such that the conformal layer fills each said isolation trench and extends horizontally away horizontally from each said isolation trench upon remaining portions of the oxide layer" as recited in independent claims 1 and 7. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at p. 5). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.*, col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claims 1 and 7. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6). As the proposed combination of references fails to teach or suggest each and every limitation of independent claims 1 and 7, Omid-Zohoor

in view of Poon cannot render claim 1 or 7 obvious. Accordingly, claims 1 and 7 are allowable.

Claims 3-6 and 8, 9, 11 and 12 are each allowable as depending from an allowable independent claim.

(b) *Claims 14-17*

The proposed combination of Omid-Zohoor and Poon fails to teach or suggest "implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," or removing "the silicon nitride layer and portions of the oxide layer underlying the first silicon dioxide layer such that the conformal second silicon dioxide layer fills each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 14. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at p. 8). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 14. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6).

As the proposed combination of references fails to teach or suggest each and every limitation of claim 14, Omid-Zohoor in view of Poon cannot render claim 14 obvious. Accordingly, independent claim 14, and dependent claims 13-17 therefrom, are allowable.

(c) *Claims 18-22, 24, 35*

The proposed combination of Omid-Zohoor and Poon fails to teach or suggest "implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a

plane of the oxide layer," "removing the first dielectric layer, polysilicon layer and portions of the oxide layer underlying the first dielectric layer such that the conformal third layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer" or "wherein the microelectronic structure is defined at least in part by the plurality of spacers, the conformal third layer, and the plurality of isolation trenches as recited in independent claims 18, 24 and 35. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at p. 14). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claims 18, 24 and 35. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6). As Omid-Zohoor in view of Poon fails to teach or suggest this limitation, the proposed combination of art likewise fails to teach or suggest that "the microelectronic structure is defined at least in part by the plurality of spacers, the conformal third layer, and the plurality of isolation trenches" as recited in claim 18.

As the proposed combination of references fails to teach or suggest each and every limitation of independent claims 18, 24 and 35, Omid-Zohoor in view of Poon cannot render claims 18, 24 and 35 obvious. Accordingly, claims 18, 24 and 35 are allowable.

Claims 19-22 are each allowable, at least, as depending from allowable claim 18.

(d) *Claim 25*

The proposed combination of Omid-Zohoor and Poon fails to teach or suggest "implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a

plane of the oxide layer," or "removing the first dielectric layer, polysilicon layer and portions of the oxide layer underlying the first dielectric layer such that the conformal third layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer" as recited in claim 25. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14, 20). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 25. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6).

As the proposed combination of references fails to teach or suggest each and every limitation of claim 25, Omid-Zohoor in view of Poon cannot render claim 25 obvious. Accordingly, claim 25 is allowable.

(e) *Claim 26*

The proposed combination of Omid-Zohoor and Poon fails to teach or suggest "implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," "heat treating the oxide layer, spacers and conformal third layer to fuse the oxide layer, spacers and conformal third layer" "removing the first dielectric layer, polysilicon layer and portions of the oxide layer underlying the first dielectric layer such that the conformal third layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer" or "wherein the microelectronic structure is defined at least in part by the plurality of spacers, the conformal third layer, and the plurality of isolation trenches as recited in claim 26. The Examiner acknowledges that Omid-

Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 26. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6). As Omid-Zohoor in view of Poon fails to teach or suggest this limitation, the proposed combination of art likewise fails to teach or suggest that "the microelectronic structure is defined at least in part by the plurality of spacers, the conformal third layer, and the plurality of isolation trenches" as recited in claim 26.

Further, the Examiner does not identify any portion of Omid-Zohoor or Poon that teaches or suggests "heat treating the oxide layer, spacers and conformal third layer to fuse the oxide layer, spacers and conformal third layer" as recited in claim 26.

As the proposed combination of references fails to teach or suggest each and every limitation of claim 26, Omid-Zohoor in view of Poon cannot render claim 26 obvious. Accordingly, claim 26 is allowable.

(f) *Claims 31-34*

The proposed combination of Omid-Zohoor and Poon fails to teach or suggest "forming a corresponding doped region below the termination of each isolation trench with a semiconductor substrate by implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," "heat treating the oxide layer, liner, spacers and conformal second layer to fuse the oxide layer, liner spacers and conformal second layer" or "removing the silicon nitride layer, polysilicon layer and portions of the oxide layer underlying

the silicon nitride layer such that the conformal second layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer" as recited in claim 31. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 31. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6). Further, the Examiner does not identify any portion of Omid-Zohoor or Poon that teaches or suggests "heat treating the oxide layer, liner, spacers and conformal second layer to fuse the oxide layer, liner spacers and conformal second layer" as recited in claim 31.

As the proposed combination of references fails to teach or suggest each and every limitation of claim 31, Omid-Zohoor in view of Poon cannot render claim 31 obvious. Accordingly, claim 31 is allowable.

Claims 32-34 are each allowable, at least, as depending from allowable claim 31.

(g) *Claim 36*

In addition to the reasons submitted with respect to independent claim 35, the proposed combination of Omid-Zohoor and Poon fails to teach or suggest "doping the semiconductor substrate with dopant having a first conductivity type; and wherein implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer further comprises; doping the semiconductor substrate below each isolation trench with a dopant

having a second conductivity type opposite the first conductivity type to form a doped trench bottom that is below and in contact with a respective one of the isolation trenches" as recited in claim 36. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Poon lacks any teaching or suggestion that ions are dopants of two different conductivities may be used. Poon, col. 2, lines 59-64.

As the proposed combination of references fails to teach or suggest each and every limitation of claim 36, Omid-Zohoor in view of Poon cannot render claim 36 obvious. Accordingly, claim 36 is allowable.

(h) *Claim 37*

In addition to the reasons submitted with respect to claims 35 and 36, the proposed combination of Omid-Zohoor and Poon fails to teach or suggest that "the doped trench bottom has a width; each isolation trench has a width and the width of each doped trench bottom is greater than the width of the respective isolation trench" as recited in claim 37. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Poon lacks any teaching or suggestion of the respective width of the trench compared to the trench bottom.

As the proposed combination of references fails to teach or suggest each and every limitation of claim 37, Omid-Zohoor in view of Poon cannot render claim 37 obvious. Accordingly, claim 37 is allowable.

(i) *Claims 38*

The proposed combination of Omid-Zohoor and Poon fails to teach or suggest "implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," or "removing the first layer and portions of the oxide layer underlying the first layer such that the second layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer wherein the microelectronic structure is defined at least in part by the plurality of spacers, the second layer

and the plurality of isolation trenches" as recited in claim 38. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 38. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6). As Omid-Zohoor in view of Poon, fails to teach or suggest this limitation, the proposed combination of art likewise fails to teach or suggest that "the microelectronic structure is defined at least in part by the plurality of spacers, the second layer, and the plurality of isolation trenches" as recited in claim 38.

As the proposed combination of references fails to teach or suggest each and every limitation of claim 38, Omid-Zohoor in view of Poon cannot render claim 38 obvious. Accordingly, claim 38 is allowable.

(j) *Claim 39*

In addition to the reasons submitted with respect to independent claim 38, the proposed combination of Omid-Zohoor and Poon fails to teach or suggest "doping the semiconductor substrate with dopant having a first conductivity type; and wherein implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer further comprises; doping the semiconductor substrate below each isolation trench with a dopant having a second conductivity type opposite the first conductivity type to form a doped trench bottom that is below and in contact with a respective one of the isolation trenches" as recited in claim 39. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Poon lacks any teaching or

suggestion that ions are dopants of two different conductivities may be used. Poon, col. 2, lines 59-64.

As the proposed combination of references fails to teach or suggest each and every limitation of claim 39, Omid-Zohoor in view of Poon cannot render claim 39 obvious. Accordingly, claim 39 is allowable.

(l) *Claim 40*

In addition to the reasons submitted with respect to claims 38 and 39, the proposed combination of Omid-Zohoor and Poon fails to teach or suggest that "the doped trench bottom has a width; each isolation trench has a width and the width of each doped trench bottom is greater than the width of the respective isolation trench" as recited in claim 40. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Poon lacks any teaching or suggestion of the respective width of the trench compared to the trench bottom.

As the proposed combination of references fails to teach or suggest each and every limitation of claim 40, Omid-Zohoor in view of Poon cannot render claim 40 obvious. Accordingly, claim 40 is allowable.

(l) *Claim 42*

The proposed combination of Omid-Zohoor and Poon fails to teach or suggest "doping the first isolation trench and second isolation trench by implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," "heat treating the oxide layer, first spacer, second spacer and conformal second layer of the first isolation structure to fuse the oxide layer, first spacer, second spacer and conformal second layer of the first isolation structure," "heat treating the oxide layer, first spacer, second spacer and conformal second layer of the second isolation structure to fuse the oxide layer, first spacer, second spacer and conformal second layer of the second isolation structure" or "removing the first layer and portions of the oxide layer underlying the first layer such that the second layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining

portions of the oxide layer wherein the microelectronic structure is defined at least in part by the active area, the second layer and the first and second isolation trenches" as recited in claim 42. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 42. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6). As Omid-Zohoor in view of Poon fails to teach or suggest this limitation, the proposed combination of art likewise fails to teach or suggest that "the microelectronic structure is defined at least in part by the active area, the second layer, and the first and second isolation trenches" as recited in claim 42.

Further, the Examiner does not identify any portion of Omid-Zohoor or Poon that teaches or suggests "heat treating the oxide layer, first spacer, second spacer and conformal second layer of the first isolation structure to fuse the oxide layer, first spacer, second spacer and conformal second layer of the first isolation structure," or "heat treating the oxide layer, first spacer, second spacer and conformal second layer of the second isolation structure to fuse the oxide layer, first spacer, second spacer and conformal second layer of the second isolation structure" as recited in claim 42.

As the proposed combination of references fails to teach or suggest each and every limitation of claim 42, Omid-Zohoor in view of Poon cannot render claim 42 obvious. Accordingly, claim 42 is allowable.

(m) *Claim 43*

The proposed combination of Omid-Zohoor and Poon fails to teach or suggest "doping the first isolation trench and second isolation trench by implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," "heat treating the oxide layer, first spacer, second spacer and conformal second layer of the first isolation structure to fuse the oxide layer, first spacer, second spacer and conformal second layer of the first isolation structure," "heat treating the oxide layer, first spacer, second spacer and conformal second layer of the second isolation structure to fuse the oxide layer, first spacer, second spacer and conformal second layer of the second isolation structure" or "removing the first layer and portions of the oxide layer underlying the first layer such that the second layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer" as recited in claim 43. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 43. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6).

Further, the Examiner does not identify any portion of Omid-Zohoor or Poon that teaches or suggests "heat treating the oxide layer, first spacer, second spacer and conformal second layer of the first isolation structure to fuse the oxide layer, first spacer, second spacer and conformal second layer of the first isolation structure," or "heat treating the oxide layer, first spacer, second spacer and conformal second layer of the second isolation structure to fuse the oxide layer, first spacer, second spacer and conformal second layer of the second isolation structure" as recited in

claim 43.

As the proposed combination of references fails to teach or suggest each and every limitation of claim 43, Omid-Zohoor in view of Poon cannot render claim 43 obvious. Accordingly, claim 43 is allowable.

2. Claims 26 and 27 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Omid-Zohoor in view of Poon and Park et al. (U.S. Patent No. 5,858,858) and Miyashita (U.S. Patent No. 6,069,083). Applicants respectfully traverse the rejection.

The discussion of Omid-Zohoor and Poon above is incorporated herein. Park is cited for teaching the formation of a trench and for heat treatment to densify the conformal layer. (Office Action mailed February 20, 2009, page 26). Miyashita *et al.* teaches methods of CMP and is cited for teaching a planarization process which etches the conformal layer and spacers faster than the first dielectric layer by a ratio of from about 1:1 to about 2:1. (Office Action mailed February 20, 2009, page 27).

The proposed combination of Omid-Zohoor and Poon, Park and Miyashita fails to teach or suggest "implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," "removing the first dielectric layer, polysilicon layer and portions of the oxide layer underlying the first dielectric layer such that the conformal third layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer" or "wherein the microelectronic structure is defined at least in part by the plurality of spacers, the conformal third layer, and the plurality of isolation trenches as recited in claim 26. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at p. 25). Park also fails to teach or suggest ion implantation. Poon and Miyashita fail to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." *See* Poon, col. 2, lines 59-64; Miyashita, col. 1, lines 24-34.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in

slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 26. Poon, Park and Miyashita fail to cure the deficiencies of Omid-Zohoor. Instead, Park and Poon teaches that trench plug (24A)(34) has substantially vertical sidewalls and does not extends horizontally away from the isolation trench. (Poon, FIG. 6; Park FIGs. 7 and 8). Similarly, Miyashita fails to teach or suggest this limitation. (Miyashita, FIGs. 5M, 6D). As Omid-Zohoor in view of Poon, Park and Miyashita fails to teach or suggest this limitation, the proposed combination of art likewise fails to teach or suggest that "the microelectronic structure is defined at least in part by the plurality of spacers, the conformal third layer, and the plurality of isolation trenches."

As the proposed combination of references fails to teach or suggest each and every limitation of claim 26, Omid-Zohoor in view of Poon, Park and Miyashita cannot render claim 26 obvious. Accordingly, independent claim 26 and dependent claim 27 therefrom are allowable.

3. Claims 31-34, 42 and 43 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Omid-Zohoor in view of Poon and Park. Applicants respectfully traverse the rejection.

The discussion of Omid-Zohoor, Poon and Park above is incorporated herein. The proposed combination of Omid-Zohoor in view of Poon and Park fails to teach or suggest "forming a corresponding doped region below the termination of each isolation trench with a semiconductor substrate by implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," or "removing the silicon nitride layer, polysilicon layer and portions of the oxide layer underlying the silicon nitride layer such that the conformal second layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer" as recited in claim 31. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Park also fails to teach or suggest ion implantation. Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane

of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 31. Poon and Park fail to cure the deficiencies of Omid-Zohoor. Instead, Poon and Park teach that trench plug (24a) 34 has substantially vertical sidewalls and does not extends horizontally away from the isolation trench. (Poon, FIG. 6; Park FIGs. 7 and 8).

As the proposed combination of references fails to teach or suggest each and every limitation of claim 31, Omid-Zohoor in view of Poon and Park cannot render claim 31 obvious. Accordingly, independent claim 31 and dependent claims 32-34 therefrom are allowable.

(b) *Claims 42 and 43*

The proposed combination of Omid-Zohoor and Poon fails to teach or suggest "doping the first isolation trench and second isolation trench by implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," or "removing the first layer and portions of the oxide layer underlying the first layer such that the second layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer wherein the microelectronic structure is defined at least in part by the active area, the second layer and the first and second isolation trenches" as recited in independent claims 42 and 43. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Park also fails to teach or suggest ion implantation. Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride

layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.*, col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claims 42 and 43. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon and Park teach that trench plug (24a) 34 has substantially vertical sidewalls and does not extends horizontally away from the isolation trench. (Poon, FIG. 6; Park FIGs. 7 and 8). As Omid-Zohoor in view of Poon and Park fail to teach or suggest this limitation, the proposed combination of art likewise fails to teach or suggest that "the microelectronic structure is defined at least in part by the plurality of spacers, the conformal third layer, and the plurality of isolation trenches."

As the proposed combination of references fails to teach or suggest each and every limitation of claims 42 and 43, Omid-Zohoor in view of Poon and Park cannot render claim 42 or 43 obvious. Accordingly, claims 42 and 43 are allowable.

4. Claims 9, 10, 12 and 13 stand rejected under 35 U.S.C. §103(a) over Omid-Zohoor and Poon in view of Miyashita. Applicants respectfully traverse the rejection.

The Court of Appeals for the Federal Circuit has stated that Adependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious.@ In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP ' 2143.03. Having failed to teach or suggest each and every limitation of the current application, the prior art referenced as rendering dependent claims 9, 10, 12 and 13 obvious, cannot serve as a basis for rejection.

The proposed combination of Omid-Zohoor in view of Poon and Miyashita fails to teach or suggest "implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer" or "removing the first dielectric layer and portions of the oxide layer underlying the first dielectric layer such that the conformal layer fills each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in independent claims 1 and therefore dependent claims 9,

10, 12, and 13. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at p. 5). Poon and Miyashita fail to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." *See* Poon, col. 2, lines 59-64; Miyashita, col. 1, lines 24-34.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claims 1, 9, 10, 12 and 13. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6). Similarly, Miyashita fails to teach or suggest this limitation. (Miyashita, FIGs. 5M, 6D).

As the proposed combination of references fails to teach or suggest each and every limitation of independent claim 1, Omid-Zohoor in view of Poon and Miyashita cannot render claim 1 or dependent claims 9, 10, 12 and 13 obvious. Accordingly, claims 1, 9, 10, 12 and 13 are allowable.

5. Claims 36, 37, 39 and 40 stand rejected under 35 U.S.C. §103(a) over Omid-Zohoor and Poon in view of Teng (U.S. Patent No. 4,963,502). Applicants respectfully traverse the rejection.

The discussion of Omid-Zohoor and Poon above is incorporated herein. Teng et al. is cited for teaching providing a p+ semiconductor substrate and implanting dopants in trenches to produce N-wells. (Teng, col. 6, lines 55-59; Office Action mailed February 20, 2009, page 37-38). Teng fails to cure the deficiencies of Omid-Zohoor and Poon.

The Court of Appeals for the Federal Circuit has stated that Adependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious.@ In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP ' 2143.03. Having failed to teach or suggest each and every limitation of the current application, the prior art

referenced as rendering dependent claims 36, 37, 39 and 40 obvious, cannot serve as a basis for rejection.

(a) *Claims 36 and 37*

The proposed combination of Omid-Zohoor and Poon in view of Teng fails to teach or suggest "implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," "removing the first dielectric layer, polysilicon layer and portions of the oxide layer underlying the first dielectric layer such that the conformal third layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer" or "wherein the microelectronic structure is defined at least in part by the plurality of spacers, the conformal third layer, and the plurality of isolation trenches as recited in independent claim 35 and thus dependent claims 36 and 37. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at p. 14). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64. Similarly, Teng fails to teach or suggest the manner in which implantation occurs.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claims 35, 36 and 37. Poon and Teng fail to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6). Teng lacks any similar teaching.

As the proposed combination of references fails to teach or suggest each and every limitation of claims 35, 36 and 37, Omid-Zohoor and Poon in view of Teng cannot render claims 35, 36 and 37 obvious. Accordingly, claims 35, 36 and 37 are allowable.

(b) *Claims 39 and 40*

The proposed combination of Omid-Zohoor and Poon in view of Teng fails to teach or suggest "implanting ions in the plurality of isolation trenches in a direction substantially orthogonal to a plane of the oxide layer," or "removing the first layer and portions of the oxide layer underlying the first layer such that the second layer fills each isolation trench and extends horizontally away from each isolation trench upon remaining portions of the oxide layer wherein the microelectronic structure is defined at least in part by the plurality of spacers, the second layer and the plurality of isolation trenches" as recited in claim 38 and therefore claims 39 and 40. The Examiner acknowledges that Omid-Zohoor fails to teach or suggest implantation of ions. (Office Action mailed February 20, 2009 at pp. 14). Poon fails to teach or suggest that ions are implanted "in a direction substantially orthogonal to a plane of the oxide layer." Poon, col. 2, lines 59-64. Similarly, Teng fails to teach or suggest the manner in which implantation occurs.

Omid-Zohoor teaches removing portions of the overfilled oxide 376 and silicon nitride layer 344 while the pad oxide layer 340 under the silicon nitride layer 344 remains. (Omid-Zohoor, col. 4, lines 60-62; FIG. 3N). The next step removes the pad oxide 340 resulting in slight oxide humps above the trenches. (*Id.,* col. 5, lines 5-10; FIG. 3O). Thus, the resulting overfilled oxide 376 does not "fill each said isolation trench and extends horizontally away from each said isolation trench upon remaining portions of the oxide layer" as recited in claim 38. Poon fails to cure the deficiencies of Omid-Zohoor. Instead, Poon teaches that trench plug 34 has substantially vertical sidewalls. (Poon, FIG. 6). Teng lacks any similar teaching.

As the proposed combination of references fails to teach or suggest each and every limitation of claims 38, 39 and 40, Omid-Zohoor in view of Poon cannot render these claims obvious. Accordingly, claims 38, 39 and 40 are is allowable.

ENTRY OF AMENDMENTS

The amendments to claims 1, 7, 14, 18, 24-26, 31, 35, 38, 42 and 43 above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application.

CONCLUSION

Claims 1, 3-22, 24-27, 31-40, 42 and 42, are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicant's undersigned attorney.

Respectfully submitted,

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